

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/GB05/000347

International filing date: 02 February 2005 (02.02.2005)

Document type: Certified copy of priority document

Document details: Country/Office: GB
Number: 0402711.6
Filing date: 07 February 2004 (07.02.2004)

Date of receipt at the International Bureau: 03 August 2005 (03.08.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



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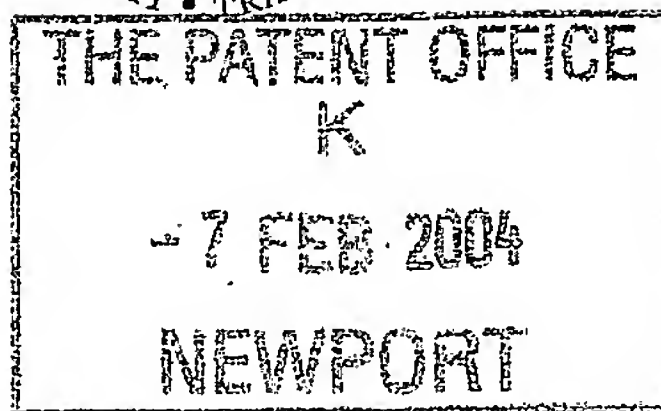
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Ladder Stabiliser

This invention relates to a ladder base stabiliser device and in particular to a device which can be attached to or form part of ladder which can be used to prevent ladders
5 from moving or slipping whilst in service, allowing ladders to be safely used on level and non level ground.

The use of ladders can give rise to safety problems even when used on a solid level base, and becomes more problematical on uneven or sloping ground, for example
10 arising from ladder movement with the top of the ladder moving sideways, or from base slip when the bottom of the ladder moves away from the wall on which the top of the ladder is resting. The recommended ladder angle of 1 in 4 or a maximum 14 degrees from vertical is often disregarded as it feels too steep and is difficult to climb easily especially when carrying anything. Ladder angle above the recommended
15 maximum greatly increases the likelihood of slipping.

It is known that, by widening the base of a ladder, the ladder is made more stable reducing the tendency for sideways movement of the top of the ladder and there have been many patent applications made for inventions which try to overcome these and
20 similar problems.

There are a number of ladder base stabilisers on the market that are either 'clip on' or 'bolt on' devices and which are designed to ensure greater safety in the use of ladders. These generally work well on solid level surfaces, but are far less effective
25 on uneven, or sloping ground. These devices not being permanently attached to the ladder are prone to become lost or not used due to the time involved in carrying extra items of equipment and the set up time involved.

A known ladder stabiliser provides suitably restrained struts to the ground from
30 points on the stiles a distance up from the base, with these struts leaning in the

storage position to operating position automatically engages the means of load transfer between the arm and the stile.

5 The stabiliser can be used with any type of ladder and the stiles of the ladder can be parallel or tapered or be angled at the bottom etc.

The hinge support is rigidly attached to the stile or plate so that there is no rotation of the support.

10 A single or multiple hinge system can be employed depending upon performance requirements. A single hinge arrangement gives a rotation movement of the stabiliser arm in a vertical plane. This is satisfactory when used with shorter arm length, but becomes difficult or unnatural with longer arms. The double axis hinge arrangement overcomes these problems and allows easier and more flexible positioning of the arms.

15 The device of the present invention can be sold separately from a ladder, or ladders can be sold with the stabiliser attached. There can be a range of lengths for the stabiliser arms; short lengths are attached to a ladder near the foot of the ladder and the stabiliser arms are mounted higher and higher up the ladder as the arms are longer. The longer the arms the greater the protection afforded to the user, but this greater length impose greater rotational loadings on the assemblies therefore stronger components are necessary.

20 When the plate is attached to the stile of a ladder the axis of the hinge is at an angle to the vertical line of the stile to which it is connected so that in use the strut swings outwardly and rearwardly from the stile.

25 By "rearwardly" is meant that the stabiliser arm moves away from the plane of the stiles of the ladder. The motion of the stabiliser arm is in an arc in three dimensions

and the arm will twist as it moves outwards from the stile, i.e. it is an arcuate movement.

5 The load transfer and locating means preferably comprises at least one flange on the plate against which the end of the arm fits and which locates the end of the arm in contact with the plate. There can be more than one flange, e.g. three flanges to form a recess into which the end of the stabiliser arm fits and holds the end of the stabiliser arm in position against the plate.

10 In one embodiment the locking means comprises a bolt on the plate which cooperates with a hole or slot in the end of the stabiliser arm to lock the arm against the plate and can be locked in place by means of a cam or other device.

15 An alternative simple locking means that can be used with the single hinge device whereby the position of the stabiliser arm on the hinge axis is allowed to move a small amount in the vertical direction against a spring that pushes it upwards. Moving the arm to the operating position allows the arm to move up the hinge axis and so clip under a projection in the top hinge support thereby locking the arm against the plate. To disengage the arrangement the user pushes down on the arm against the
20 spring to release catch. This arrangement is especially useful for short stabiliser arms to be attached to a ladder near the end of the ladder nearest the ground.

For longer stabiliser arms the locking means preferably comprises a strut, one end of which is pivotally attached to the stabiliser arm at a distance spaced apart from the
25 hinge and the other end of which is attachable to the stile of the ladder a distance spaced apart from the plate, whereby when the plate is attached to the stile of a ladder and the hinge is in the open position and the stabiliser arm is located outwardly and rearwardly from the stile of the ladder and the strut is connected to the stile of the ladder the strut locks and locates the stabiliser arm in position. When the stabiliser
30 arm is in the open position the strut should be rigid so that the stabiliser arm is locked.

in position with the load being transmitted through the stabiliser arm to the plate. When under load the strut assists to resist the rotational forces by becoming a tension member rather than compression.

- 5 Provided that alternative locking of the device is provided the strut can be replaced by a flexible tie adjacent to the end of the stabiliser arm remote from the hinge which is attachable to the stile of the ladder.

10 In order that the strut folds flat in the stored position there is a pivot or hinge in the strut between its ends.

Due to the rotation of the arm the end fixings of the strut need to allow movement both in the horizontal plane as well as vertically. This is achieved by using a compound hinge arrangement.

15

Preferably there is a simple clip which can hold the stabiliser arms in the inoperative position against the stile, allowing easy storage and transport.

20

Preferably on the lower end of each stabiliser arm there is mounted a foot component that allows movement in two directions, maintaining the adequate transfer of loads to the ground whatever the slope of the surface, e.g. with up to 10 degrees of crossfall being accommodated by movement of the foot component. This foot component can be telescopic so that the length of the stabiliser arm can be varied.

25

The device of the present invention can be used in conjunction with the ladder levelling device as described in Patent Application PCT/GB98/03465 in which there is disclosed a device that can accommodate uneven ground by adjusting the effective length of the ladder stiles and can also be used with a range of ladders. This same device can also be incorporated within the lower section or the stabiliser arm to

30

provide the necessary adjustment in length.

- Preferably the main longitudinal components of the device will be constructed of extruded and hollow box sections. The design of the extruded sections allow the incorporation of end fixings generally without special machining operations.
- 5 Preferably there are cast or moulded solid or semi solid inserts in the box sections at the hinge end of the stabiliser arm to provide support for the attachment of the hinges and other fittings and to allow adequate load transfer from arm to stile.
- 10 While with the multi axis device the open and closed positions are dictated by the design and sizes of the components the movement of the arm between the two limit conditions is very flexible or floppy. In order to limit this uncontrolled movement there is preferably a guide channel on the plate into which a guide follower such as a knob attached to the upper end of the stabiliser arm, fits so that, as the arm moves from the closed position against the stile to the open position the guide follower
- 15 moves along the channel and the stabiliser arm is constrained to move along a predetermined path. The greater the width between the inner and outer guides the greater the degree of flexibility afforded in getting the arm round or pass obstructions on the ground.
- 20 Alternatively rather than having two totally separate axes for the hinge arrangement with their intersection being beyond the hinge plate, the two axes could be arranged so that their intersection becomes a point with both axes sharing a common pin at that location combined two further hinge points. While this three point hinge arrangement would be feasible it is likely to cause wear and stability problems
- 25 resulting in extra manufacturing costs.
- Optionally the length of the stabiliser arms can be extended, e.g. by having a telescopic section on the end of the stabiliser arm which can change the length of the stabiliser arm. Generally, the simplest way of providing a locking facility between
- 30 two telescopic tubular components without loose bolts etc. is to have an internal

spring with one or two projecting lugs attached that pass through the inner tube and engage into a series of holes in the outer tube.

In use with the simple hinge embodiment of the invention, the stabiliser is folded flat
5 against the stile of the ladder, when it is to be used, the arm is swung outwardly and rearwardly from the stile so the end of the arm travels in an arcuate path and is not simply swung out from the ladder as in prior art devices. When the arm is fully extended, the end of the arm is pressed against the plate so the loads on the arm are transferred to the stile through the plate, and the end is held in position by the
10 locating means. In one embodiment a bolt on the plate fits into a slot in the end of the arm and is locked in position by a cam. The arm is then held rigidly in place. When there is a lower strut this strut is fully extended and locked in position when the arm is in position and this locks the arm in place.

15 With any particular version of the device one or all of the alternative types of locking means can be used, the choice being dependant upon operating requirement.

The invention is described in the accompanying drawings in which the stabiliser is shown attached to a ladder.

20

Fig. 1 is a side view of the stabiliser in the closed position

Fig. 2 is a side view of the stabiliser in the open position

Fig. 3 is a view of the attachment to the ladder

Fig. 3a is a schematic view of the hinge

25 Fig. 4 shows the end of the stabiliser attached to the ladder

Fig. 5 shows the attachment of the hinge to the ladder

Fig. 6 shows the hinge in the closed position

Fig. 7 shows the hinge in the open position

Figs. 8 -10 show details of the attachment to the ladder

30 Fig 11 is a plan view of the open stabiliser

Fig. 12 is a plan view of the closed stabiliser

Fig. 13 shows the lower stabiliser arm from the side in its closed position

Fig. 14 shows the lower stabiliser arm in its open position

Fig. 15 shows a plan view of the stabiliser arm in its open position

Figs. 16 and 17 shows a locking system

5 Figs. 18 and 19 shows an alternative locking system

Figs. 20 to 24 show a different embodiment of the stabiliser

Fig. 25 shows the path of the stabiliser arm and

Fig. 26 shows versions of the stabiliser attached to a ladder

10 Referring to fig. 1 and 2 a ladder stile (1) has a hollow stabiliser arm (2) attached to it by a hinge mechanism. The end of the arm (2) has a bent steel hinge plate and guide support (7) at its end and there is a guide knob (6) which runs in guide (5) covered by a protective enclosure. There is a hinge (3) mounted on the ladder which is connected to hinge (4) by a hinge plate. When the arm (2) moves from the closed position of fig. 1 to the open position of fig. 2 about the hinges (3) and (4) the guide knob (6) moves along the guide (5).

15

Referring to fig. 3 there is a backing plate (8) to which the guide (5) is attached; there are thrust plates (9) and stress transfer plate (10) mounted on backing plate (8). There is a hinge (3) mounted on plate (17) attached to or forming part of (10).

20

The structure is attached to the ladder rung (11) by bolt (18) (fig. 5). The hinge is shown in fig. 3a which shows hinge (3) and hinge (4) connected by hinge plate (16).

25 Referring to fig. 4 inside the end of the arm (2) there is solid thrust block (14) with a splayed end (13) which has a bent steel hinge plate and guide support (12).

Moving from the closed position of fig. 6 to the open position of fig. 7 the arm moves about the hinges (3) and (4) and in the open position the end of the stabiliser arm fits into and presses against the thrust plates (9).

30

the stile as shown, there is a hinge plate (57) attached by a first hinge (49) to the stress transfer plate (52) which incorporates thrust plates (44a) and by a second hinge to bent steel hinge plate (46) attached to stile (42). There is a guide knob (48) which runs in outer guide (58) within a protective enclosure. There is a solid thrust block
5 (54) with a splayed end (47) inside hollow stabiliser arm (42). When the stabiliser leg moves from the closed position of fig. 22 to the open position of fig 24 via the position of fig. 23 the hinge plate moves as shown in figs. 20 and 21.

Referring to figs. 20 and 21 these show the movement of the hinge as the stabiliser
10 moves from the closed position of fig. 22 to the open position of fig. 24. In the position of fig. 22 the hinge plate (45) is against the rotation stop (55) as shown so the stabiliser is held in position. Fig. 24a shows a bolt (60) which fits into a slot in the arm and is locked in place in the open position by cam (61).

Referring to fig. 25 this shows a view from below. "A" shows a movement of the arm
15 (61) with a single hinge and "B" shows the trajectory of the base of stabiliser with a compound hinge with paths B1 and B2 showing possible trajectories without a guide system and B3 with a guide system.

Referring to fig. 26, figs. 26a to 26d show stabilisers of increasing size. In the
20 smallest stabiliser of fig. 26a the arm is locked in place by the locking system of figs. 18 and 19 and in this size no tie or lower strut is required. In fig. 26b there is a tie (62) together with a locking device on the attachment of the arm to the stile. In fig. 26c there is the strut (63) and optionally a locking device on the attachment of the
25 arm to the stile. In the largest stabiliser there is the strut (64) a locking device on the attachment of the arm to the stile and optionally an additional tie (65) if found necessary due to the forces on the hub assembly attaching the arm to the stile.

6. A ladder stabiliser as claimed in any one of the preceding claims in which the locking means comprises a bolt on the plate which cooperates with a hole or slot in the end of the stabiliser arm to lock the arm against the plate.
- 5 7. A ladder stabiliser as claimed in claim 6 in which the bolt fits into a slot in the end of the arm and can be locked in place by means of a cam.
8. A ladder stabiliser as claimed in any one of claims 1 to 5 in which, in the locking means, the position of the stabiliser arm on the hinge axis is allowed to move a small amount in the vertical direction against a spring that pushes it upwards, moving the
- 10 arm to the operating position allows the arm to move up the hinge axis and so clip under a projection in the top hinge support thereby locking the arm against the plate; to disengage the arrangement the user pushes down on the arm against the spring to release catch.
- 15
9. A ladder stabiliser as claimed in any one of the preceding claims in which the locking means comprises a strut, one end of which is pivotally attached to the stabiliser arm at a distance spaced apart from the hinge and the other end of which is attachable to the stile of the ladder a distance spaced apart from the plate whereby,
- 20 when the plate is attached to the stile of a ladder and the hinge is in the open position and the stabiliser arm is located outwardly and rearwardly from the stile of the ladder and the strut is connected to the stile of the ladder the strut locks and locates the stabiliser arm in position.
- 25 10. A ladder stabiliser as claimed in any one of the preceding claims in which there is a flexible tie adjacent the end of the stabiliser arm remote from the hinge which is attachable to the stile of the ladder.

11. A ladder stabiliser as claimed in any one of the preceding claims in which the hinge is formed by two flanges on the plate through which there are bolts which pass through equivalent members on the end of the strut.

5 12. A ladder stabiliser as claimed in any one of the preceding claims in which the hinge is a compound hinge comprising two hinges connected by a hinge plate.

10 13. A ladder stabiliser as claimed in any one of the preceding claims in which the main longitudinal components of the device is constructed of extruded and hollow sections and there are solid inserts in the box sections at the hinge end of the strut to provide support for the attachment of the hinges and other fittings.

15 14. A ladder stabiliser as claimed in any one of the preceding claims in which there is a guide channel on the plate into which a guide follower fits so that, as the strut moves from the closed position against the stile to the open position the guide follower moves along the channel and the end of the strut is constrained to move along the correct path.

20 15. A ladder stabiliser as claimed in any one of the preceding claims in which there is a pivot or hinge in the arm between its ends.

25 16. A ladder stabiliser as claimed in any one of the preceding claims in which on the lower end of the strut is mounted a foot component that allows movement in two directions

17. A stabiliser as claimed in any one of the preceding claims in which the length of the strut is adjustable.

- 14 -

18. A stabiliser as claimed in any one of the preceding claims in which there is a clip which can hold the struts in the inoperative position against the stile for storage and transport.
- 5 19. A ladder having a stabiliser as claimed in any one of the preceding claims attached to it.
-

- 15 -

Abstract

A stabiliser is attached to a ladder by a hinge at an angle to the vertical line of the stile so that the stabiliser is swung out from and away from the ladder to provide a
5 stabilising support for the ladder.

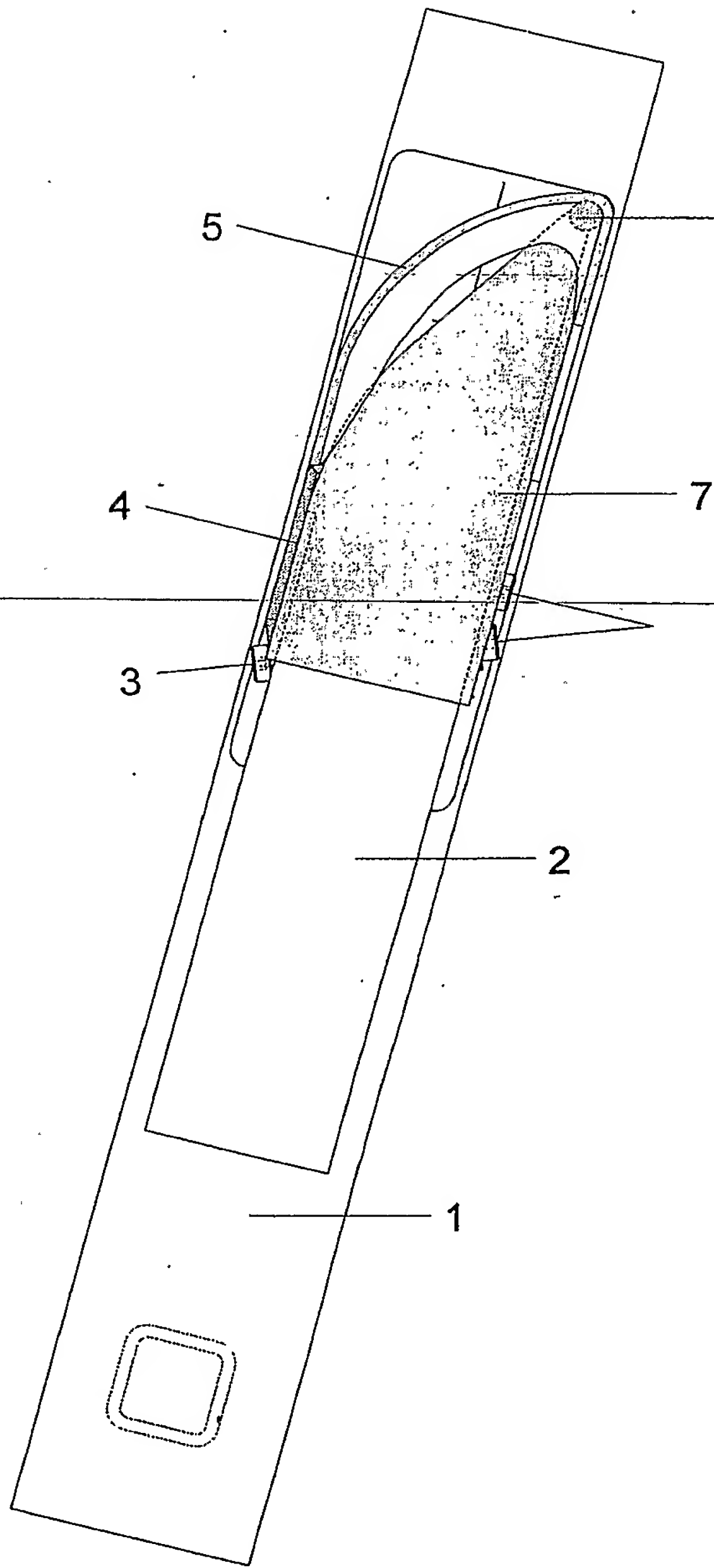


Fig. 1

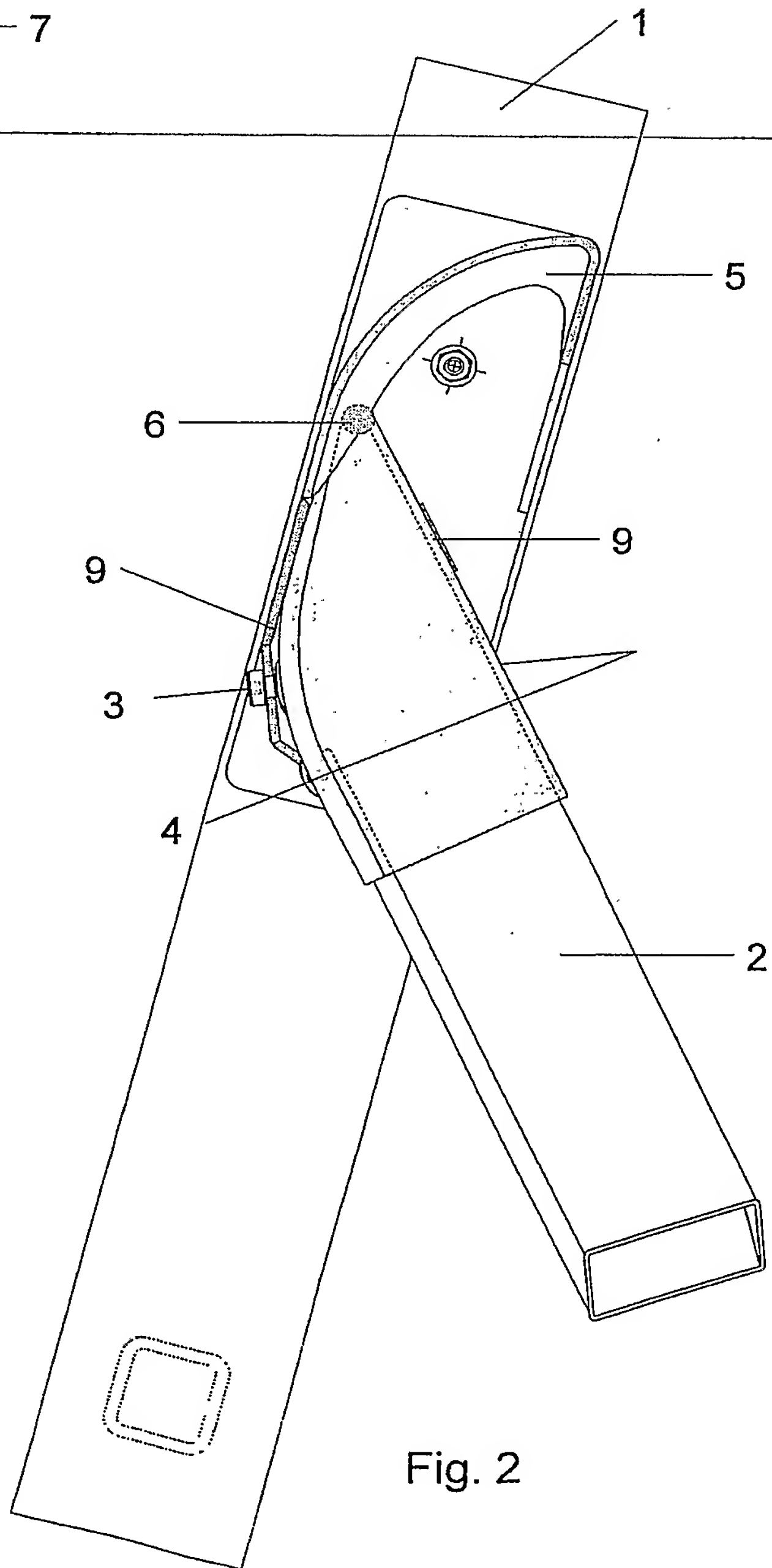


Fig. 2



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1

3

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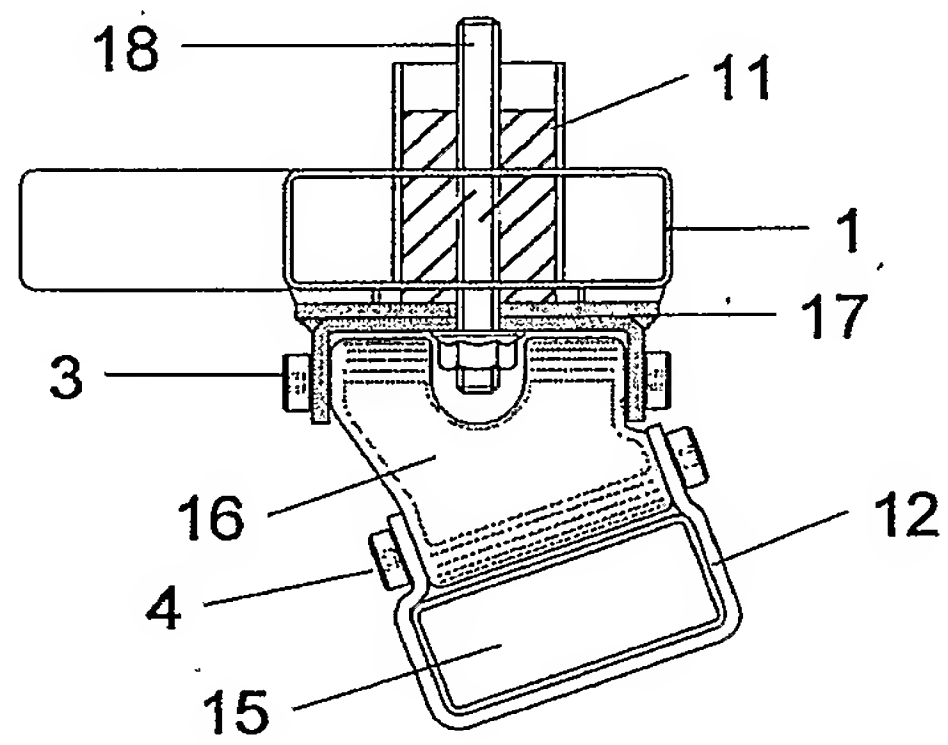
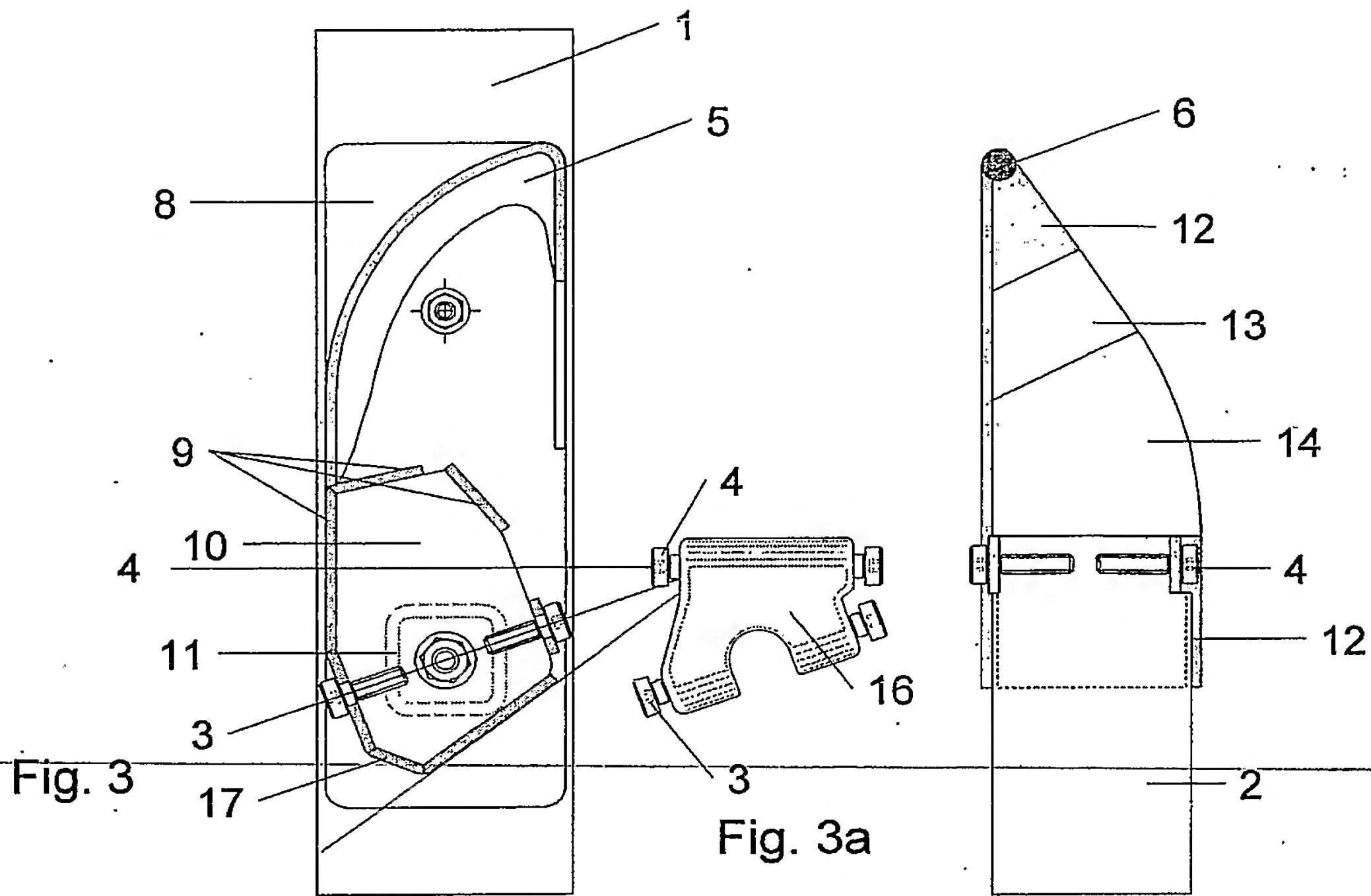


Fig. 5

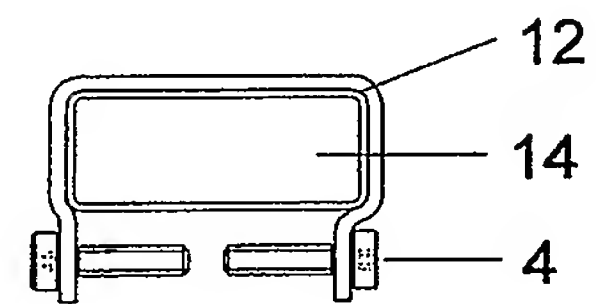


Fig. 4

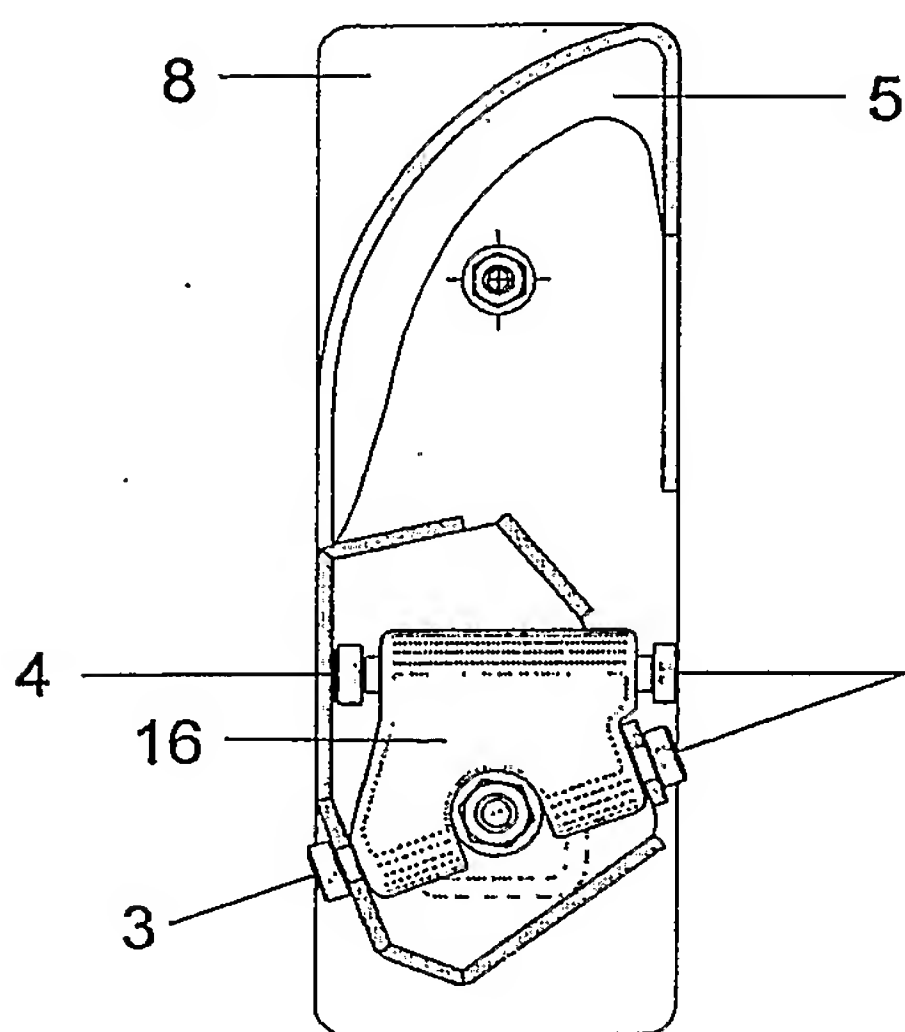


Fig. 6

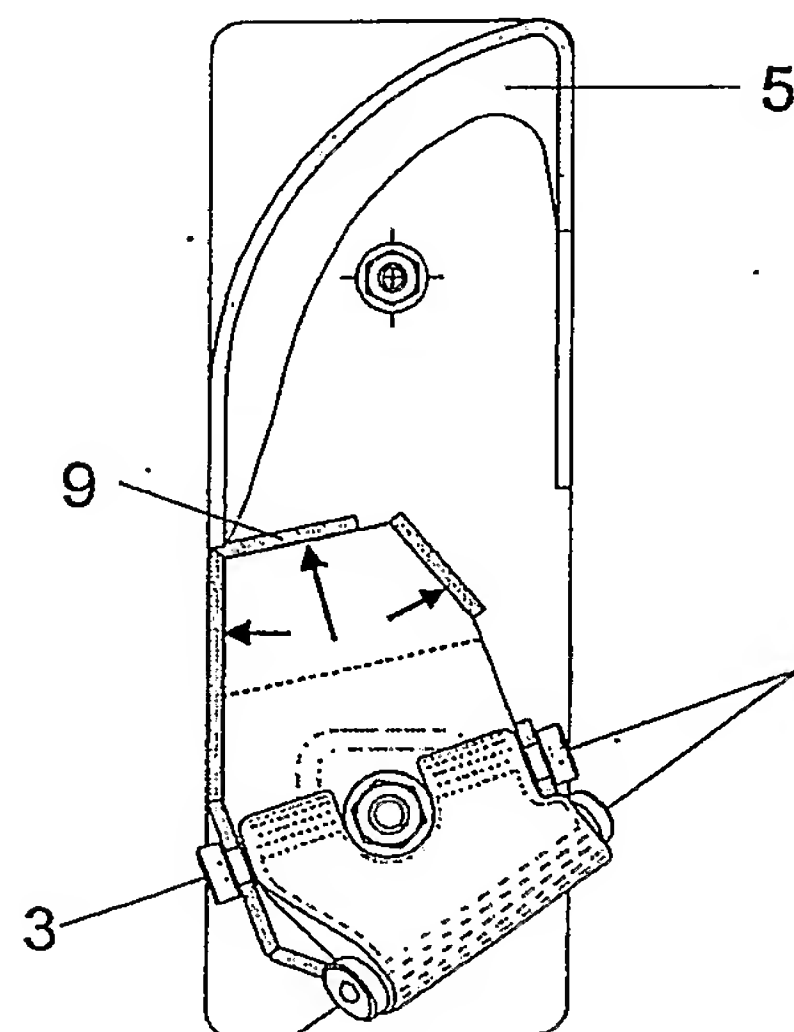


Fig. 7



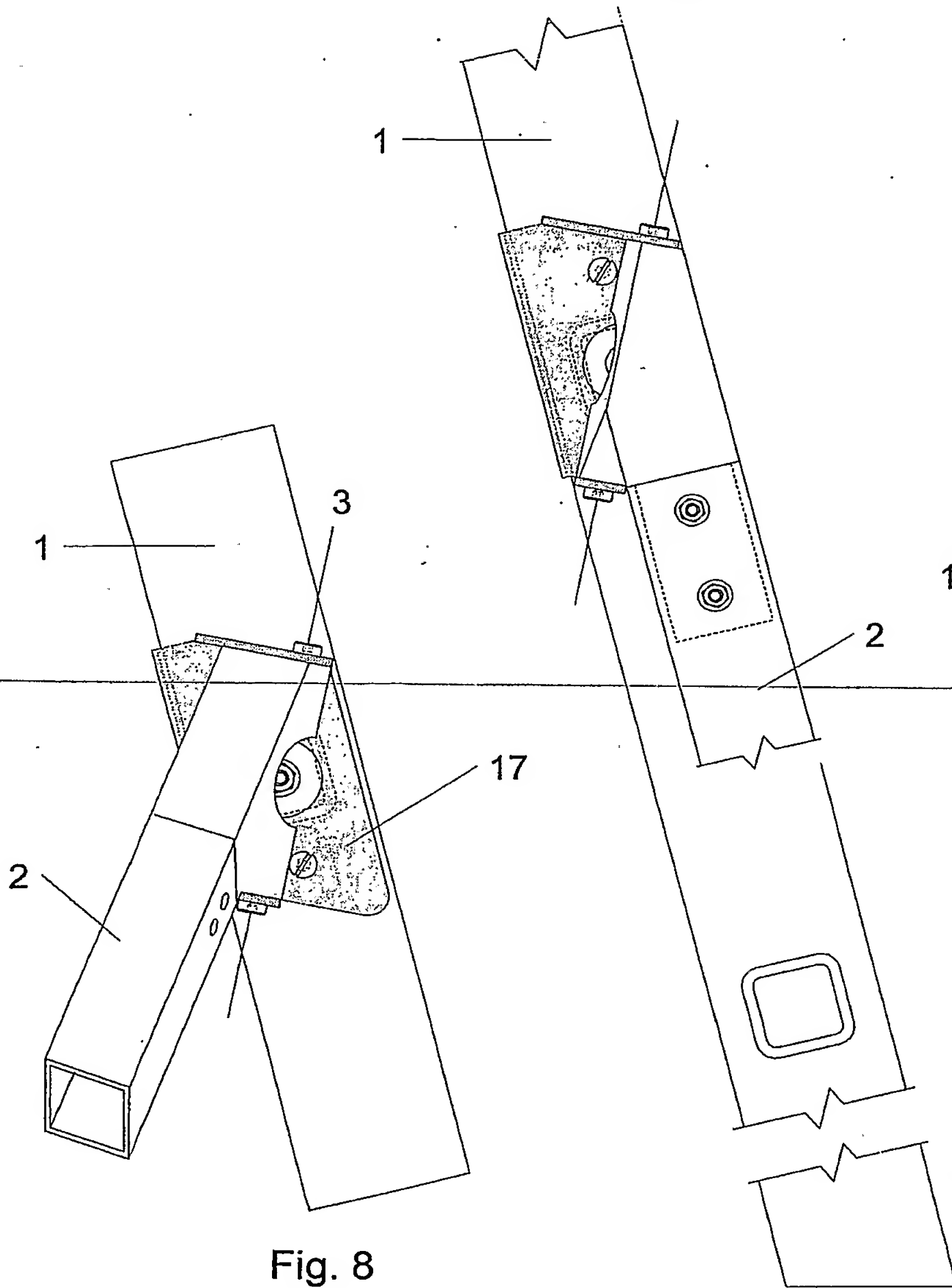


Fig. 8

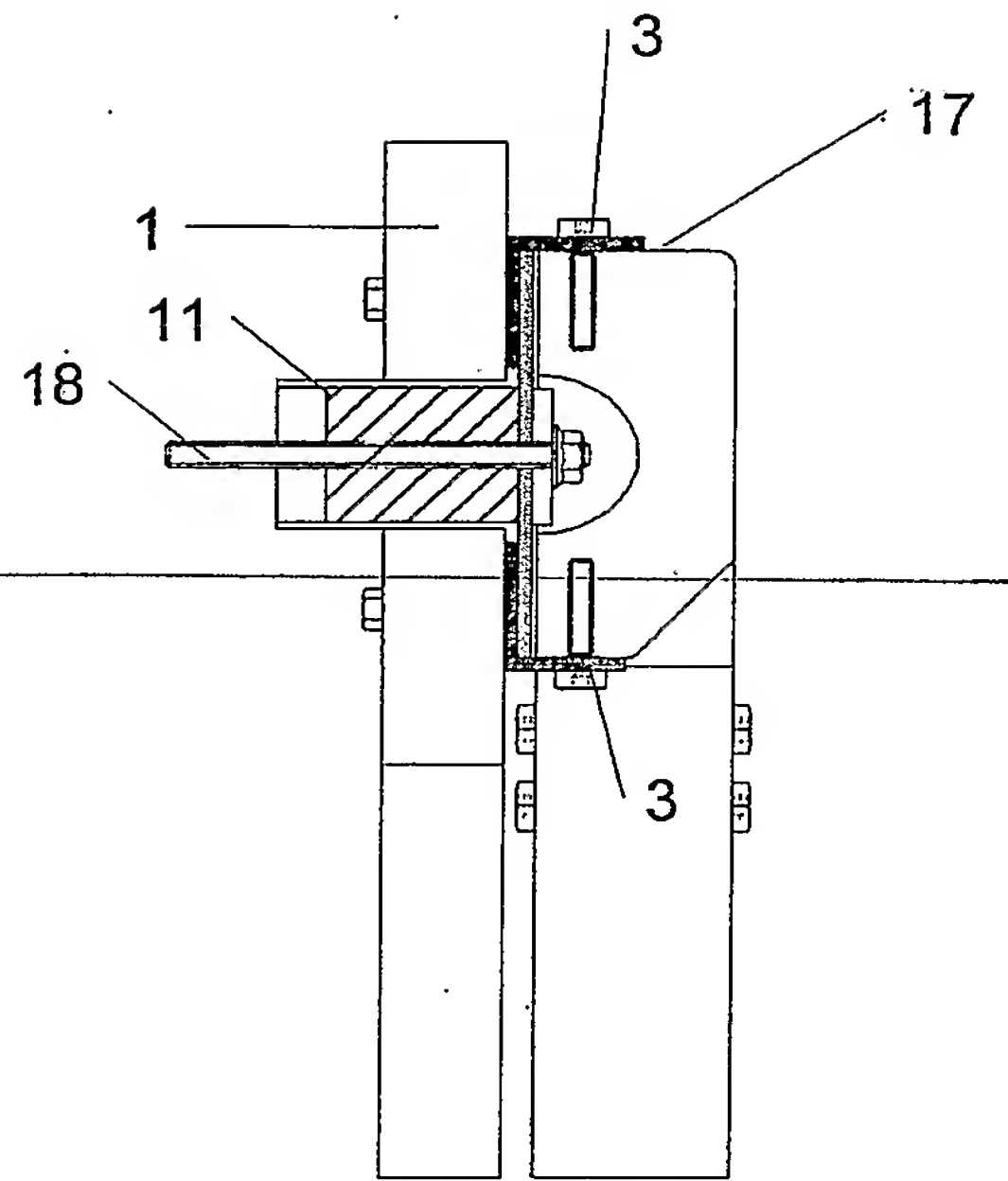


Fig. 10

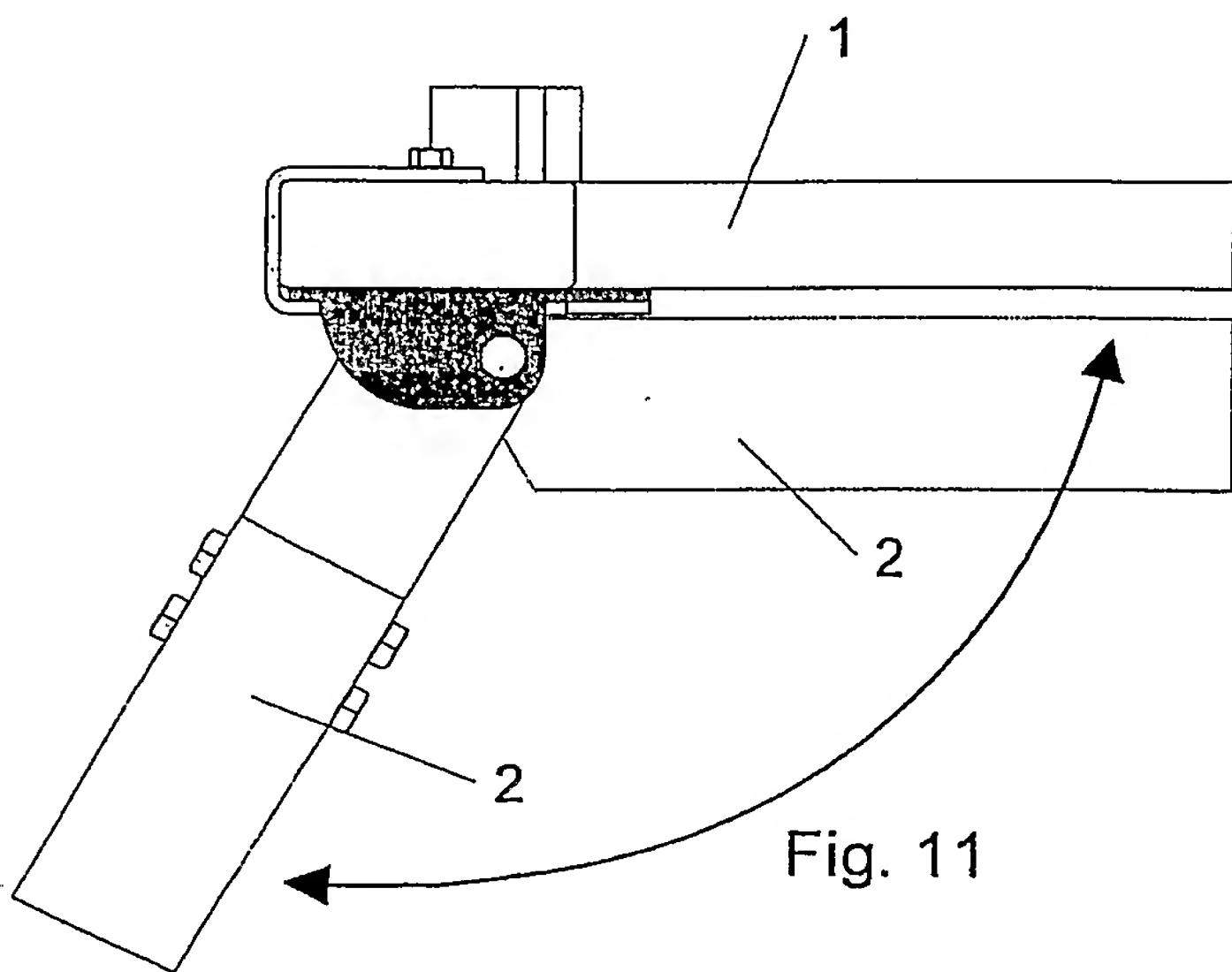


Fig. 11

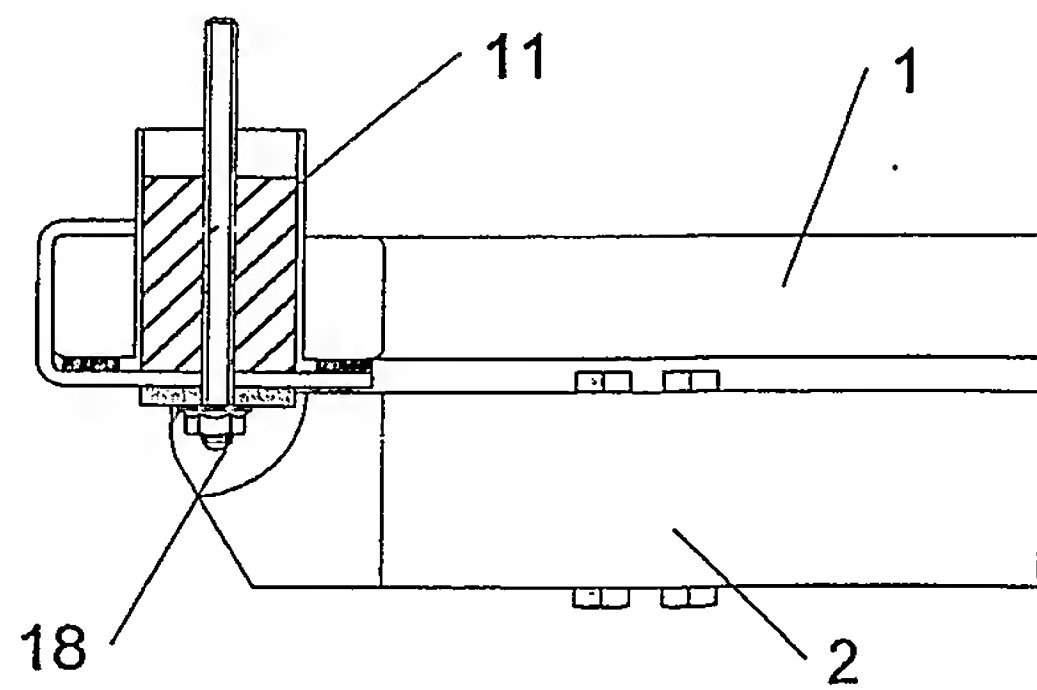
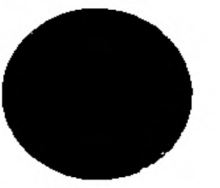


Fig. 12



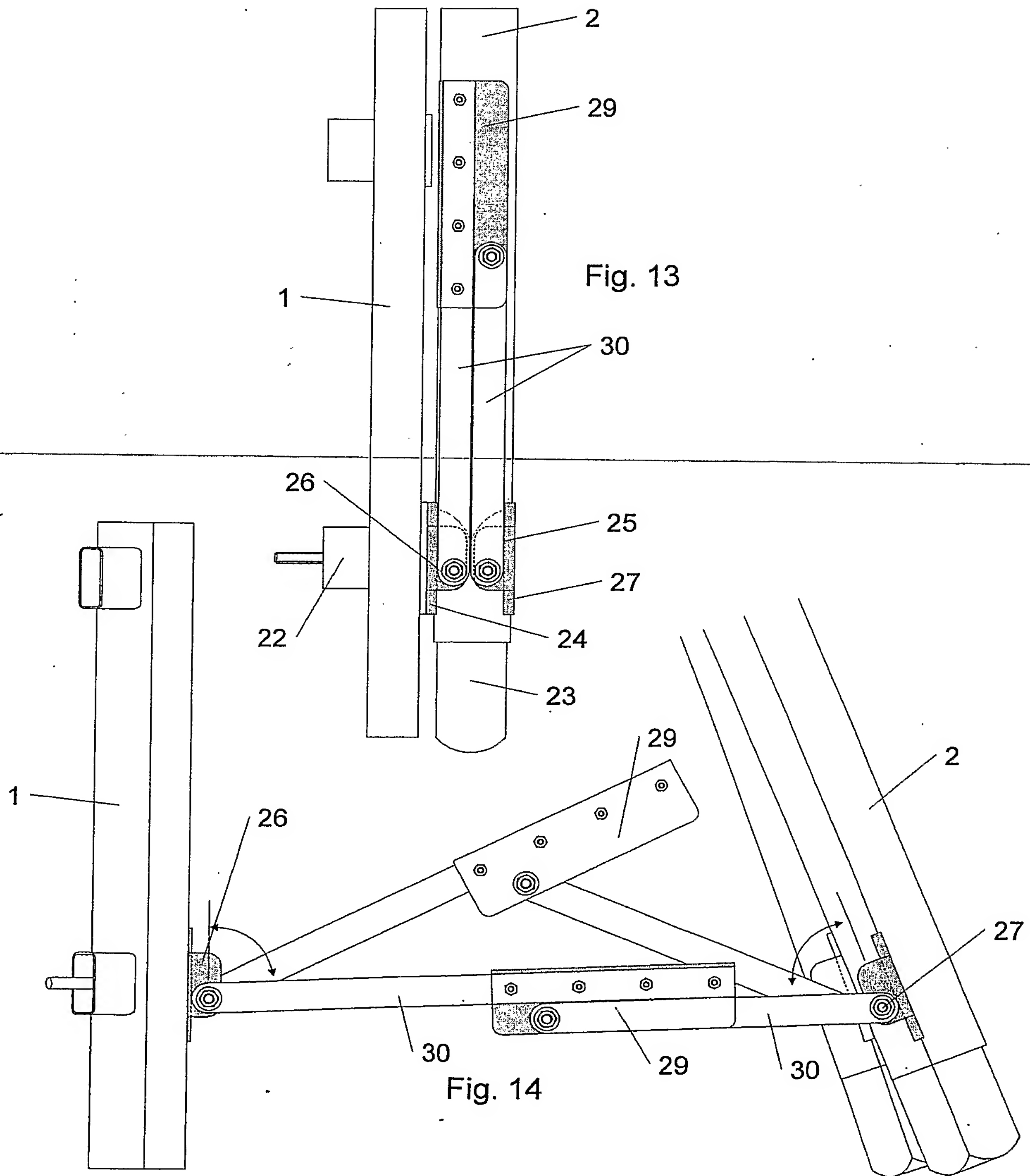


Fig. 14

Fig. 15



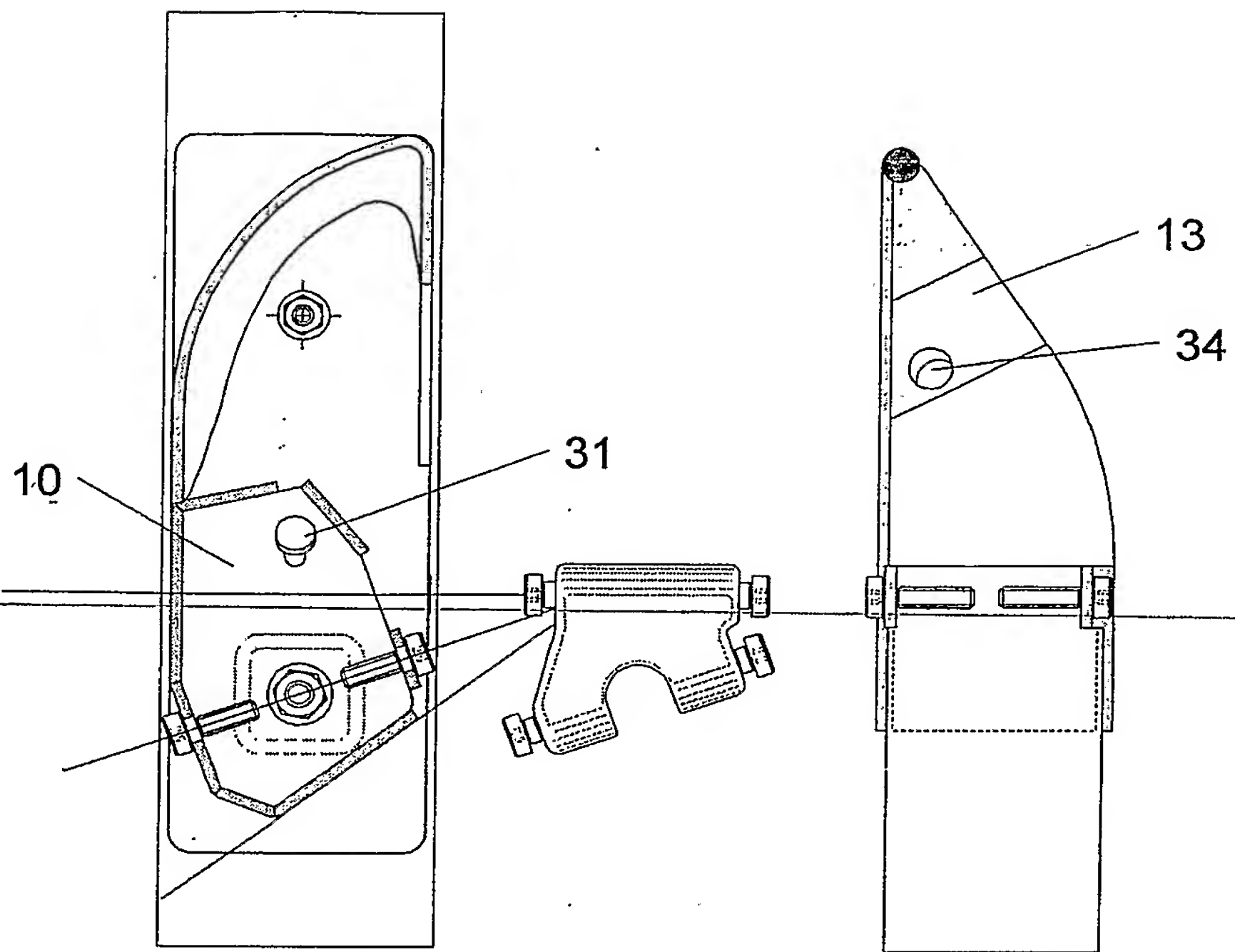


Fig. 16

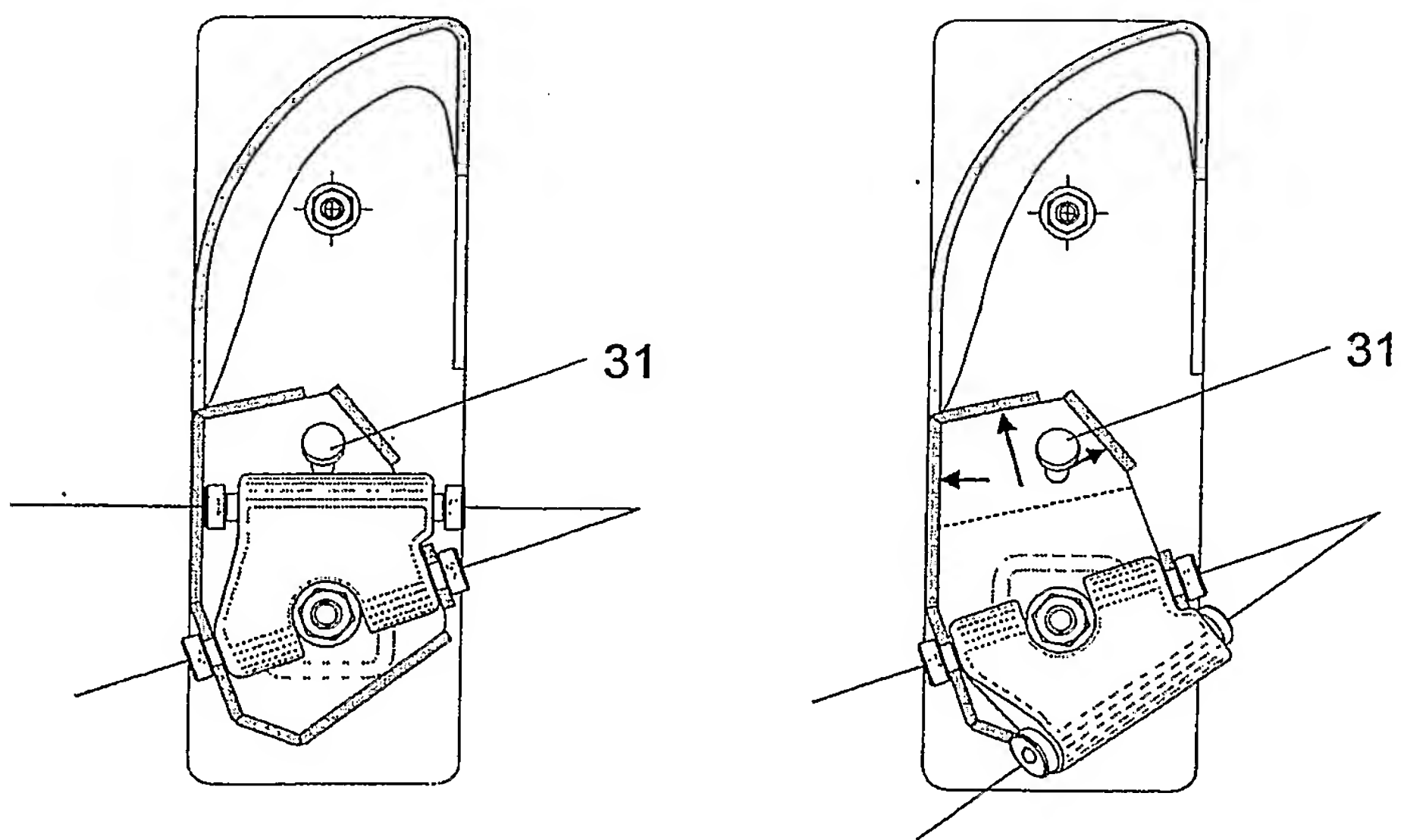
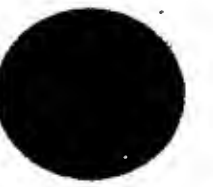


Fig. 17



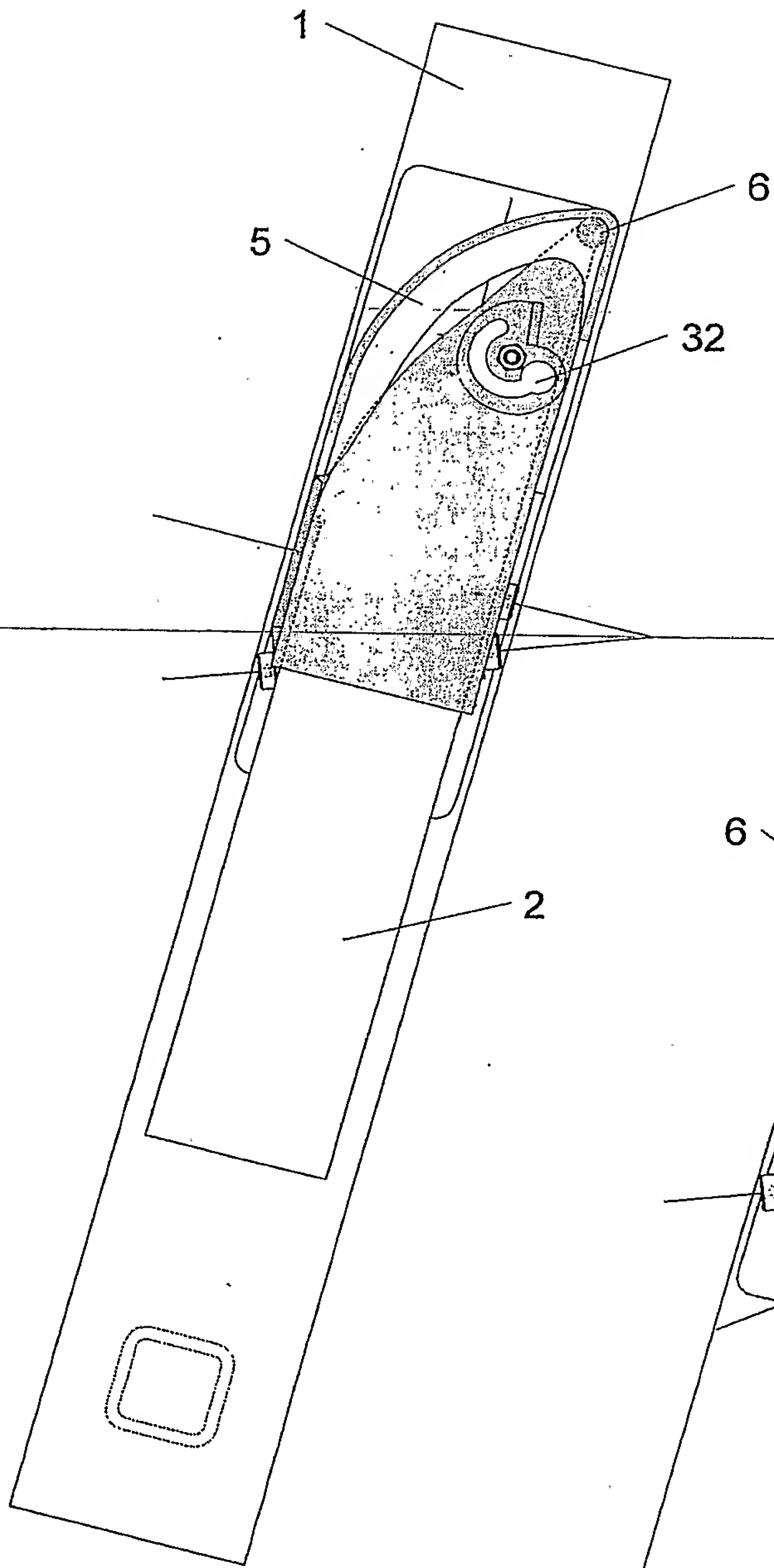


Fig. 18

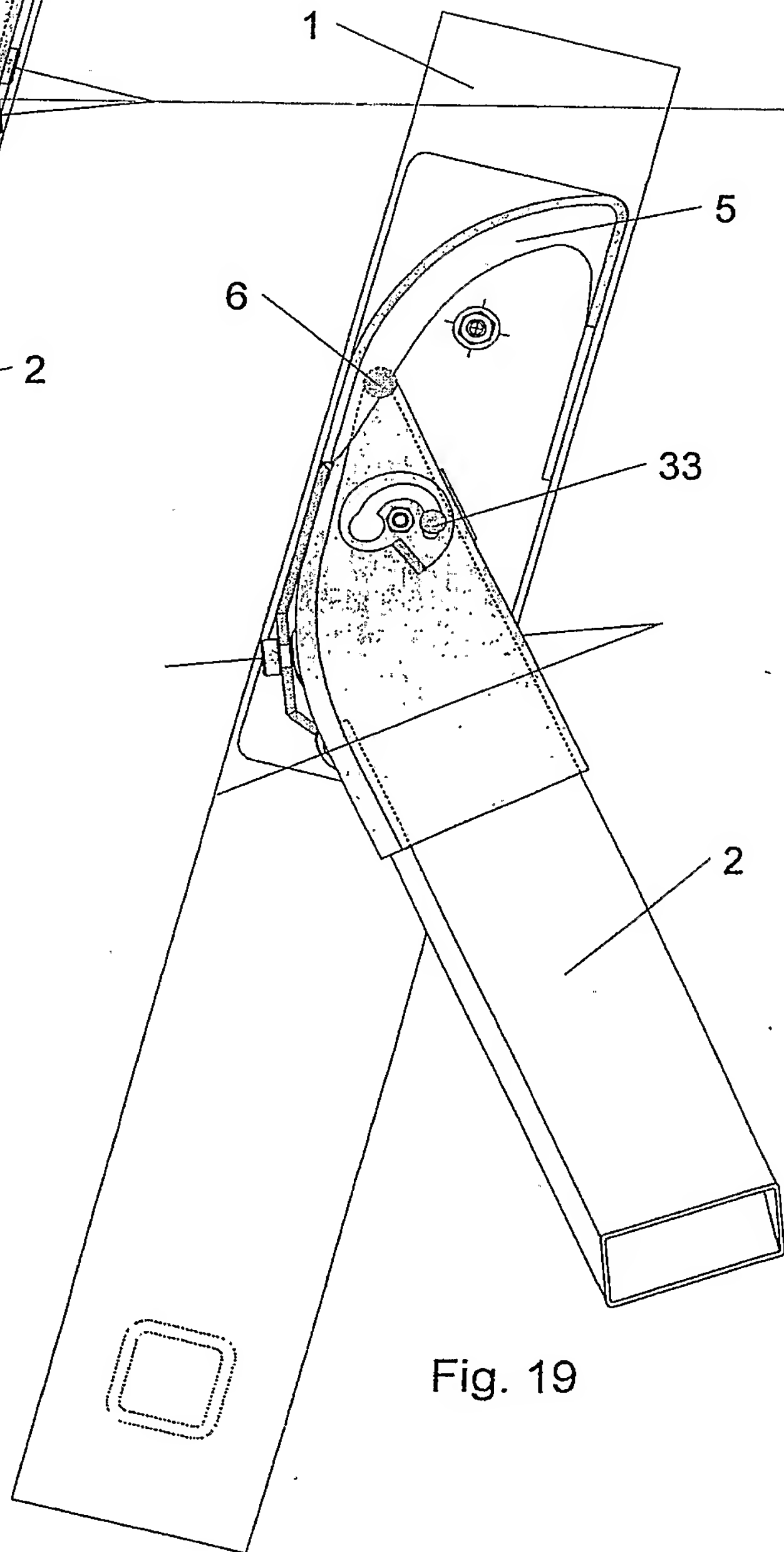
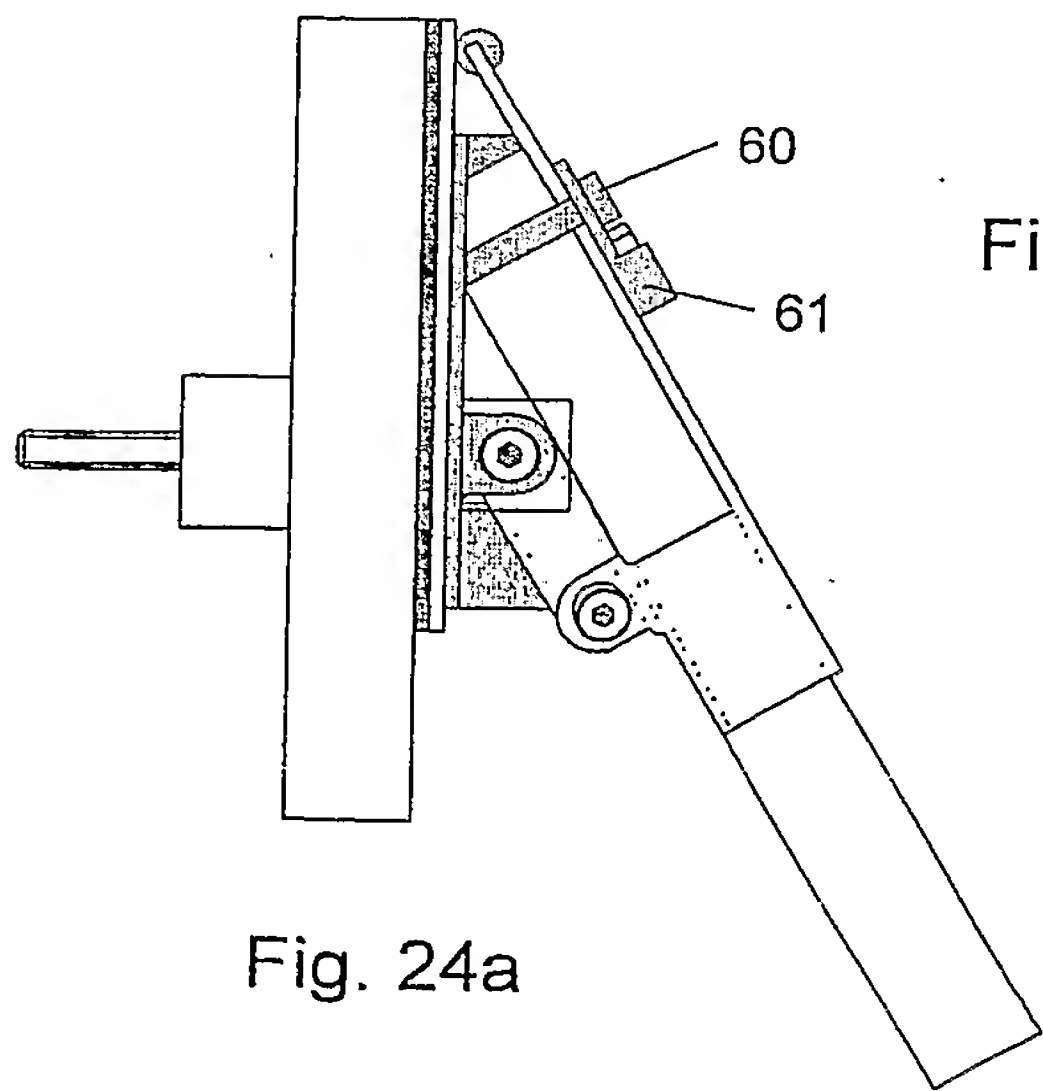
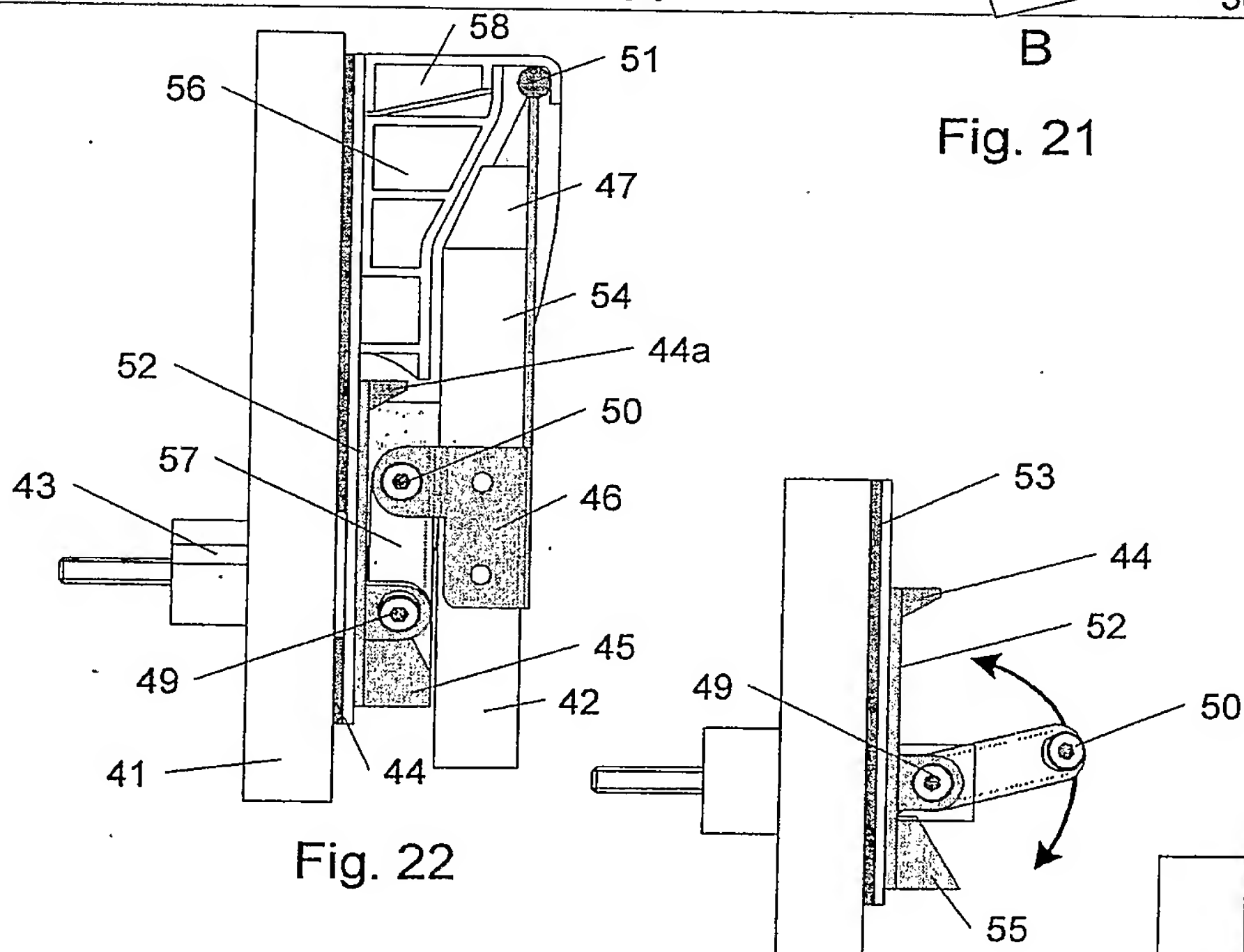
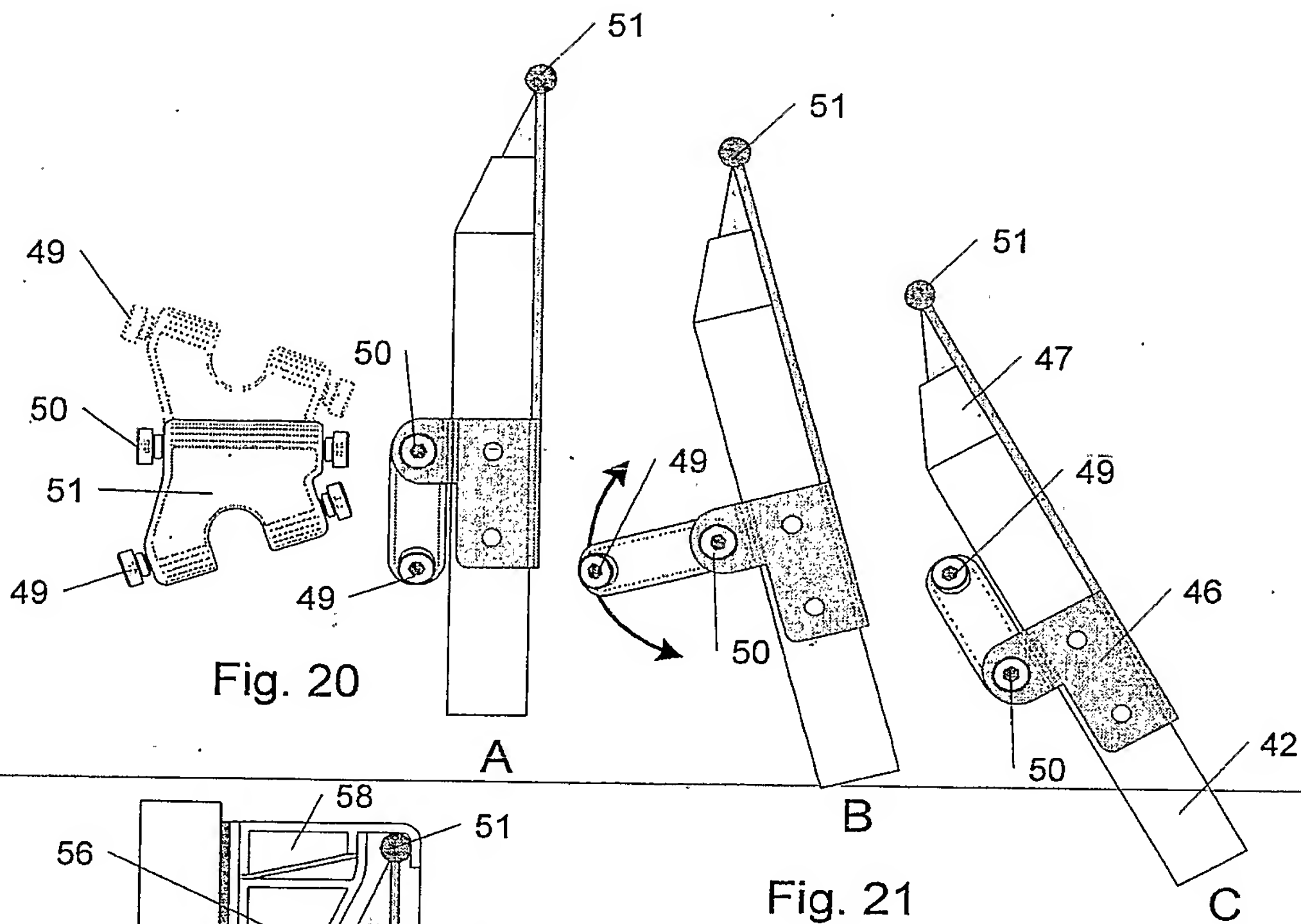


Fig. 19







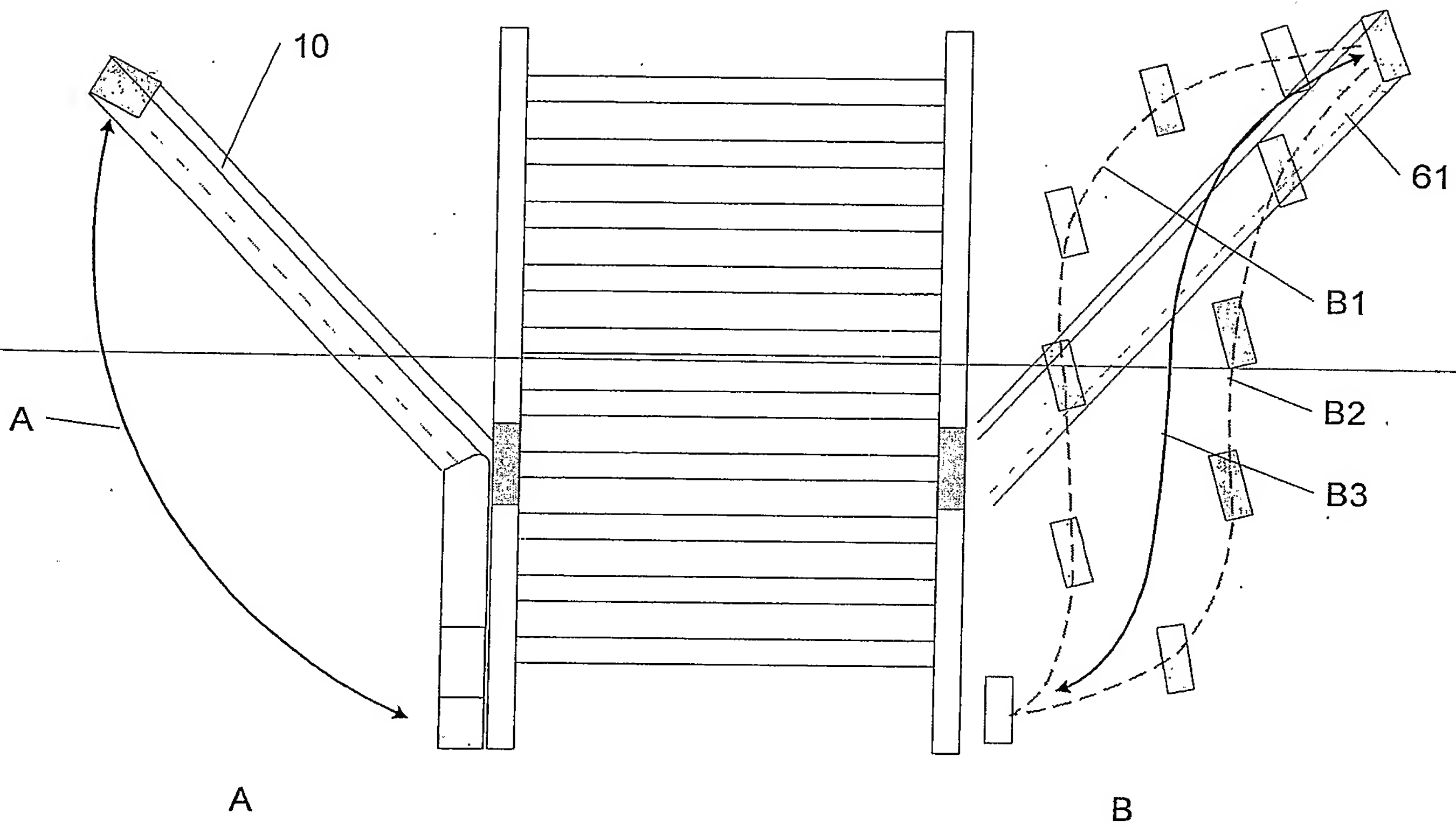


Fig. 25



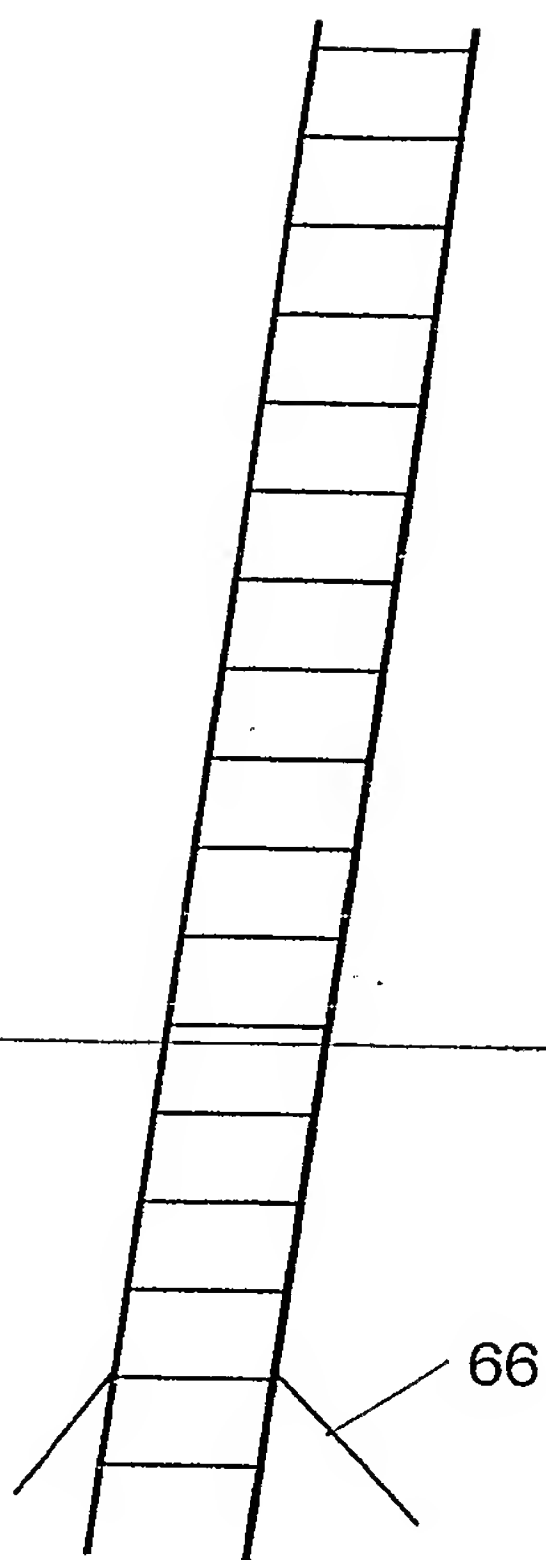


Fig. 26a

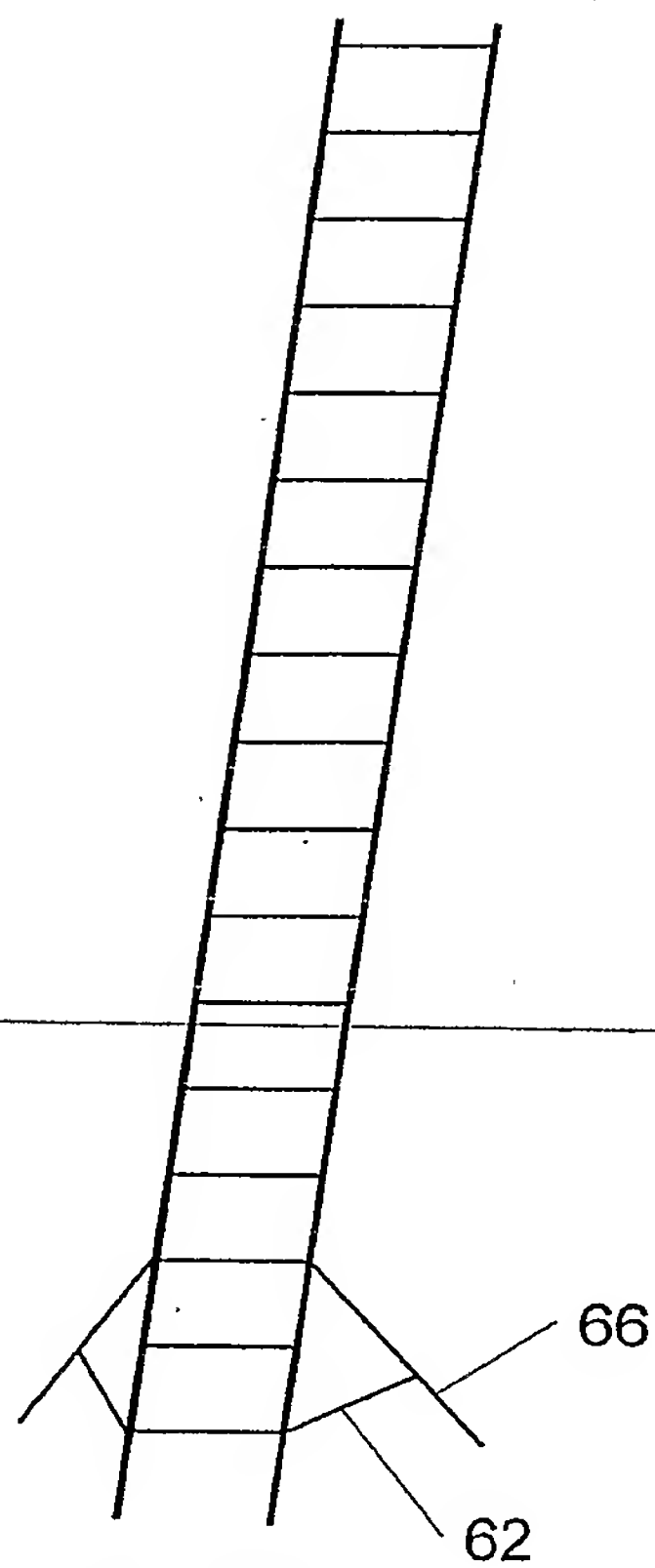


Fig. 26b

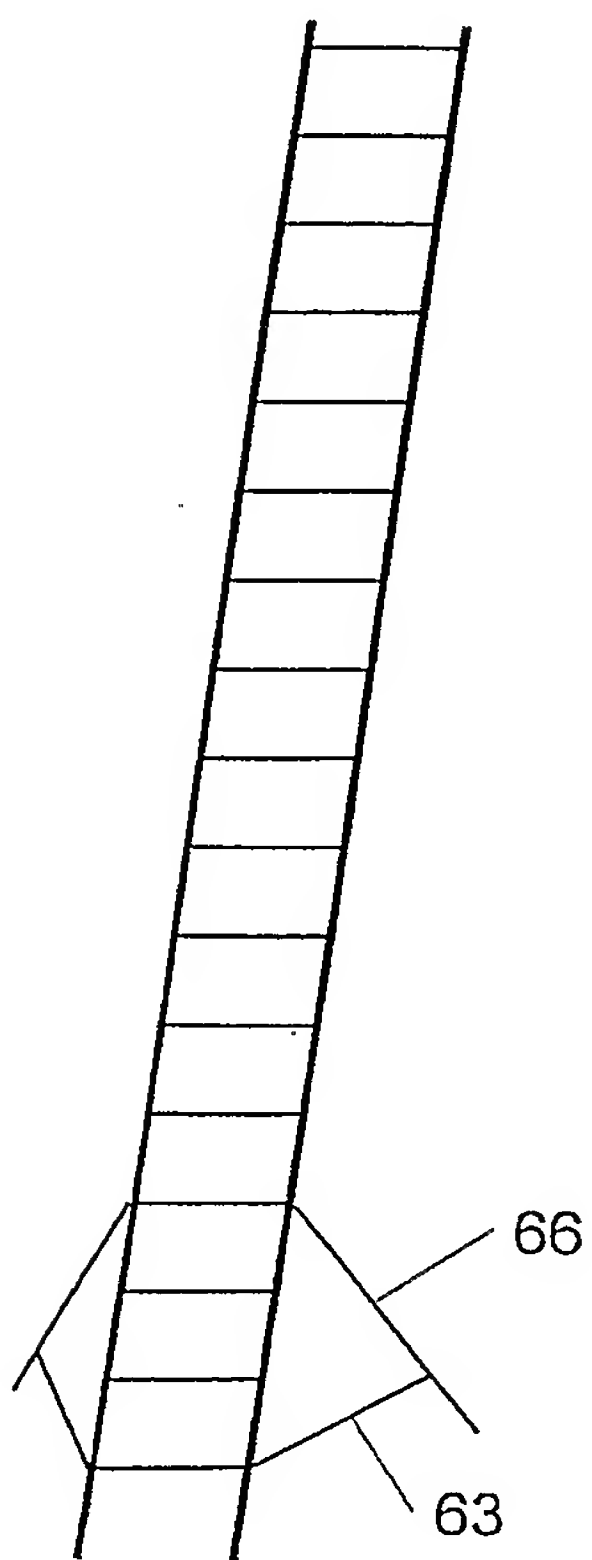


Fig. 26c

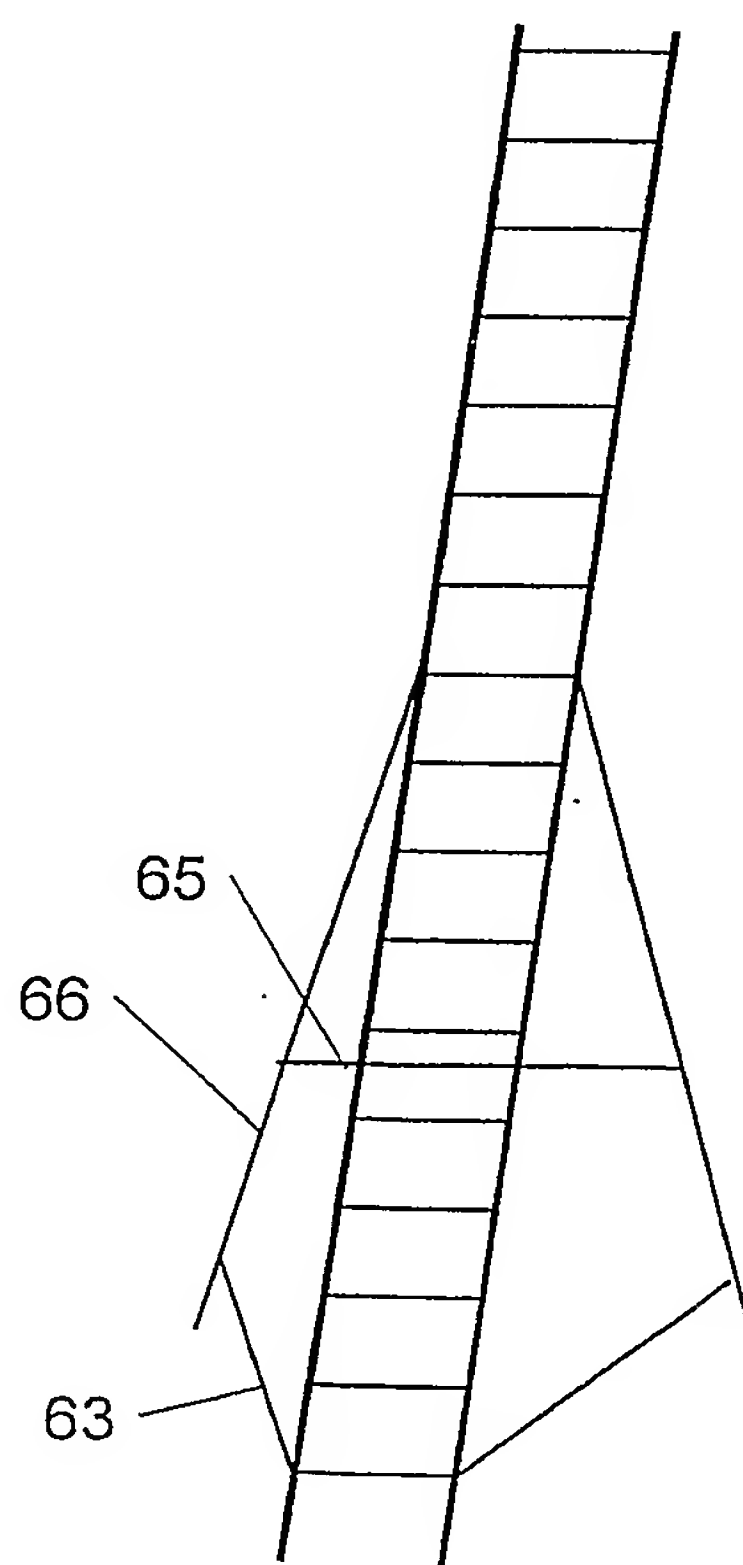


Fig. 26d

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27 JUL 2005

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